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(54) **SUTURE THREAD**

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Description

TECHNICAL FIELD

5 **[0001]** The present application relates to a suture thread used for a surgical operation and a suturing method using the suture thread, and more particularly, to a suture thread that does not require a knotting procedure during a suture operation, a method of manufacturing the suture thread, and a suturing method using the suture thread.

BACKGROUND ART

10 **[0002]** In a suturing process performed for various surgical operation such as suturing of damaged muscles, blood vessels, nerves, injuries, or surgical cuts, double eyelid surgery, wrinkles plastic surgery, etc. a time-consuming, annoying, and very important work greatly affecting a result of surgery is a process of tying a knot to prevent the release of a suture thread after suturing a suturing site. During a suturing process, a knot is provided to prevent the release of a suture at a start portion and an ending portion of a suture or at a middle portion if necessary.

15 **[0003]** Since to shorten an operation time and complete an operation as quick as possible is very important, suturing and knotting techniques are essential for stable and efficient operations. However, it is not easy to quickly tie a knot at a distance by using tools to bond a suturing site in a body during an operation using a laparoscope, an endoscope, or an arthroscope, for example.

20 **[0004]** Conventionally, to tie a knot of a suture thread during suturing, an operator uses two tools to fix or wrap a suture thread while holding the suture thread. Since a large space is needed to manipulate the two tools, an operator needs to be highly experienced to shorten a surgery suture time as short as possible within a limited space such as the abdominal cavity. Thus, a method and a suturing tool, for example, a tool having a great degree of freedom such as a Cambridge endo, a Real hand, a Radius surgical system, etc., or robots to easily, quickly, and firmly tie a suture thread into a knot

25 in a limited space have been developed. **[0005]** Japanese Patent Laid-open Publication No. 2006-25867 discloses a suture thread for a surgery in which a suture thread is woven to be hollow inside in a lengthwise direction and a suturing tip is coupled to both end portions of the suture thread. Japanese Patent Laid-open Publication No. 2003-19683 discloses a surgical robot for ligation and suturing to prevent damage to tissue of a living body. However, a surgical robot such as a Davinci robot system that may facilitate suturing and knotting in an endoscope operation is very expensive and requires a large installation space, which discourages a wide use thereof. Thus, there is a demand to develop a suturing method that may be easily used at a lower cost and a suture thread and needle to enable the method.

30 Further examples of sutures according to the prior art are known from each of prior art documents JP3587571, US 2007/0038249, disclosing a suture as in the preamble of claim 1, and EP 2108316.

35 DETAILED DESCRIPTION OF THE INVENTION

TECHNICAL PROBLEM

40 **[0006]** Disclosed are a method of quickly and easily suturing in a limited space in a surgical operation, a tool for the method (suture thread support body, needle accommodation body, a suture thread including suture thread support body and/or needle accommodation body), and a method of manufacturing the tool.

45 **[0007]** Further disclosed are a suture thread developed to perform suturing without tying some or all of knots that are supposed to be tied during suturing, and a manufacturing method thereof, a suture thread support body needed therefor, a needling accommodation body, and a suturing method using the same.

TECHNICAL SOLUTION

50 **[0008]** According to the present invention there are provided a suture as claimed in claim 1, along with a method for manufacturing same as claimed in claim 4.

55 **[0009]** According to an aspect, there is disclosed a support body for preventing a tip end of a suture thread from being pulled into skin or tissue during suturing, and a suture thread in which the support body is coupled to an end of the suture thread. The other end of the suture thread in which the support body is coupled to the end passes through skin or tissue of a suturing site by a suture needle and thus suturing is performed. When suturing with the suture thread, the support body works as a knot and thus the end of the suture thread to which the support body is coupled is fixed at a portion where the suturing starts. Thus, since there is no worry of untying of the suture, no more knotting is needed in a suturing process. Also, the end of the suture thread may be fixed to the skin or tissue more firmly than a case of a suture thread only having a knot.

[0010] According to another aspect, there is disclosed a needle accommodation body having a shape of a tube having a through-hole through both ends, and a suture thread having the needle accommodation body. The needle accommodation body may have a shape of a truncated circular cone or truncated pyramid in which a diameter of a through-hole increases from one end portion to the other end portion or a shape of a circular column or a prism in which a diameter of a through-hole is constant. The needle accommodation body may be formed of a firm material or a flexible material if necessary. The suture needle is inserted in the needle accommodation body. The suture needle coupled to the needle accommodation body has a shape of part of the needle main body fitting to the through-hole of the needle accommodation body. The suture needle may have a shape in which part of the needle main body has a diameter larger than that of a bottom end portion of the needle accommodation body. The suture needle may be pulled from the bottom end portion of the needle accommodation body to be removed from the needle accommodation body. The suture needle is connected to the needle accommodation body.

[0011] According to another aspect, there is disclosed a suture thread having a needle accommodation body and a suture needle in which part of the needle main body of the suture needle coupled to the needle accommodation body is formed larger than the bottom end portion (end portion having a relatively larger diameter) of the needle accommodation body. The needle accommodation body may have a shape of a tube having a through-hole through both ends, a shape of a truncated circular cone or truncated pyramid in which a diameter of a through-hole increases from one end portion to the other end portion, a shape of a circular column or a prism in which a diameter of a through-hole is constant. The suture thread is connected to the needle accommodation body. The suture needle may be pulled from the bottom end portion of the needle accommodation body to be removed from the needle accommodation body.

[0012] According to another aspect, there is disclosed a method of manufacturing a support body and/or a needle accommodation body.

[0013] When the suture thread having the needle accommodation body is in use, in the final step of suturing, the suture needle is penetrated into or inserted into other tissue around a suturing site from the needle accommodation body into the tissue. Then, the suture needle is pulled from the bottom end of the needle accommodation body and thus removed therefrom. Accordingly, the needle accommodation body removed of the suture needle remains in the tissue and the suture thread used for suturing is still coupled to the needle accommodation body. As a result, a suture is not untied even without making a knot at a final portion of the suturing.

ADVANTAGEOUS EFFECTS

[0014] According to the present disclosure, a suture thread may facilitate a stable suture without tying a knot. When a suture thread with a support body and/or needle accommodation body is in use, an effect of a firm knot may be obtained without spending time to tie a knot. Accordingly, a suture time may be remarkably reduced through a simple suture technique. Also, without employing a suturing technique requiring experience, a suture operation may be stably and easily performed.

[0015] Furthermore, when the suture thread according to the present disclosure is in use, since a suture operation may be completed with only one tool. Thus, even when an area to be treated using an endoscope is small, suture may be performed quickly and accurately.

[0016] Furthermore, when a suture thread, a suturing method, a needle accommodation body, and a support body as disclosed are made of a material that may be absorbed by a living body, a process of removing the elements after an operation may be unnecessary.

DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 illustrates suture threads having various support bodies according to embodiments as disclosed.

FIG. 2 illustrates a suture thread having a support body and a needle according to an embodiment as disclosed.

FIG. 3 illustrates a needle accommodation body according to an embodiment as disclosed and a suture thread having the needle accommodation body, in which FIG. 3 illustrates that a needle is inserted in a needle accommodation body that is coupled to a suture thread, FIG. 3C illustrates a needle accommodation body according to an embodiment as disclosed, and FIG. 3D illustrates a method of coupling a needle accommodation body and a suture thread.

FIG. 4 illustrates the shapes of a needle accommodation body and a needle according to another embodiment as disclosed;

FIG. 5 illustrates a suture thread with a needle accommodation body provided at each of both end portions.

FIG. 6 illustrates a variety of suture threads to which a support body and a needle accommodation body are coupled respectively to one end portion and the other end portion of a suture thread.

FIG. 7 illustrates that a suture thread forming a loop is connected to a needle accommodation body according to an embodiment as disclosed.

FIG. 8 illustrates a barbed suture thread according to an embodiment as disclosed.

FIG. 9 illustrates a suture thread with a cone and a knot according to an embodiment as disclosed.

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<List of major reference numerals>

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10: suture thread 20: needle accommodation body

21: bottom end portion of needle accommodation body

22: front end portion of needle accommodation body

23: hole of needle accommodation body

30: suture needle 31: needle main body

32: needle tip

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33: stepped portion of needle main body

34: needle hole

40: support body 41: hole of support body

42: knot

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50: barb 51: cone

BEST MODE

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[0018] The present invention will now be described more fully with reference to the accompanying drawings, in which exemplary embodiments are shown. These embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the concept of the invention to those skilled in the art. In the drawings, a needle portion is exaggerated for easy understanding of the invention. It may be understood that the length of a thread connected to a needle or a needle accommodation body is quite long in actual use.

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[0019] FIG. 1 illustrates suture threads 10 having various support bodies 40 according to embodiments as disclosed. The support body has a diameter larger than that of the suture thread and a shape such as a stick, a ball, a circular column, a circular cone, a pyramid, a truncated circular cone or truncated pyramid, a disc, a plate, a polyhedron, etc. The support body may have any shape and size that supports the suture thread so that an end portion of the suture thread is prevented from being pulled into a suturing site. The support body may be a uniform solid matter or may have at least one hole in both end portions of the support body. For example, the support body is a truncated circular cone and has a through-hole through both ends of the support body. The diameter of the hole or cavity is greater than that of a suture thread in use. The support body may be formed of a material such as nylon, polypropylene, for example, MESH, poly(vinylidene fluoride), polyester, stainless steel, titanium, etc, that is not absorbed by a living body. Also, the support body may be formed of an absorbable material according to a purpose thereof. For example, polylactic acid, polydioxanone, copolymer of lactic acid and glycolic acid, etc. may be used. When a material that may be absorbable by a living body is used, the support body does not need to be removed after suturing a human body.

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[0020] A method of coupling the suture thread and the support body includes a method of melting and bonding an end portion of a suture thread and/or a portion of a support body to be coupled to the suture thread, a method of forming at least one hole, for example, holes 41 of FIG. 8C, in a support body, passing a suture thread through the hole, and tying a knot 42 of the suture thread to have a diameter greater than that of the hole of the support body, and a method of passing a suture thread passing through one hole to the opposite direction through another hole. However, a variety of methods may be employed (FIG. 1).

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[0021] The suture thread having the support body is used by being inserted in suturing needle or coupled to a needle accommodation body. A suture needle in use may be formed of a material such as metal that is not absorbed or an absorbable material such as polydioxanone (PDS). The suture needle may have a linear or curved shape overall. A needle tip may have a generally and widely used shape such as round or cut appearance.

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[0022] A method of coupling the suture thread to the suture needle includes a method of inserting a suture thread in a hollow needle main body and pressing a needle, a method of forming a hole (needle eye) in a needle and inserting a suture thread in the hole, and a method of cutting a groove in a wall of a needle having a cavity and guiding a suture thread on the groove. However, other various methods may be employed therefor.

[0023] When suturing with a suture thread having the above-described support body, there is no need to separately tie a knot on a suture start portion and also the suture thread may be more firmly fixed than in a case of only tying a knot. This is useful not only for suturing an outer part of a human body but also for suturing an internal part of the human body such as an endoscope operation.

[0024] FIG. 2 illustrates the suture thread having the support body and a suturing needle according to an embodiment as disclosed. Referring to FIG. 2, a truncated circular cone type support body having a through-hole through both ends thereof is used. When a bottom surface of a support body having a larger diameter, like the support body, is arranged to face the suture needle, a firm knot effect may be obtained.

[0025] FIG. 3 illustrates a needle accommodation body according to an embodiment and a suture thread having the needle accommodation body. Referring to FIG. 3, the needle accommodation body 20 is coupled to the suture thread 10. The needle accommodation body 20 has a shape of a tube with a through-hole through both ends thereof and also has a shape of a truncated circular cone or truncated pyramid in which a diameter of a through-hole increases from one end to the other end. The diameter of the through-hole of the needle accommodation body 20 is adjusted such that a needle may pass through and be inserted in the through-hole considering the diameter of a suturing needle to be used.

[0026] A method of coupling the suture thread to the needle accommodation body includes a method of melting an end of a suture thread and/or part of a needle accommodation body to be coupled to the suture thread to adhere the suture thread and the needle accommodation body and a method of forming at least one hole in a needle accommodation body, inserting a suture thread in the hole, and tying the suture thread into a knot or tying suture threads together. However, other various methods may be used therefor.

[0027] The suture needle 30 is coupled to the needle accommodation body. The suture needle 30 includes a needle main body 31 and a needle tip 32 formed at one end of the needle main body. The needle main body is formed to have a diameter that gradually increases from the needle tip to the other end of the needle main body. The suture needle is inserted in the needle accommodation body to which the suture thread is coupled and suturing is performed. At the final step of suturing, the suture needle penetrates other tissue around a suturing site, or penetrates or pierces other tissue around the suturing site so as to advance the needle accommodation body into the tissue. Then, the suture needle may be removed by pulling the suture needle toward a bottom end portion 21 of the needle accommodation body. Accordingly, the needle accommodation body without the suture needle 30 is left in the tissue and the suture thread used for suturing is still coupled to the needle accommodation body, and thus, suturing may not come untied without tying a knot at the final step of suturing.

[0028] Since the needle accommodation body has a shape of a circular cone or pyramid in which the diameter of the through-hole increases from one end portion to the other end portion of the needle accommodation body, part of the needle main body inserted in the needle accommodation body also has a diameter that gradually increases toward the other end thereof. Thus, when the suture thread is pulled after the suture needle is inserted into a suturing site during the suturing process, the suture needle is not disassembled from the needle accommodation body. To this end, the through-hole of the needle accommodation body has a size enough to accommodate the suture needle. Also, the size of the through-hole at a front end portion 22 of the needle accommodation body is less than that of a portion of the needle main body having a maximum diameter.

[0029] FIG. 4 illustrates the shapes of the needle accommodation body and the suture needle according to another embodiment. As the needle accommodation body and part of the or the whole needle main body of the suture needle is formed larger than a bottom end portion of the needle accommodation body, a step is formed and thus the suture needle is prevented from being disassembled from the needle accommodation body when during suturing the suture needle is pulled in a direction in which suturing is performed. The needle accommodation body has a shape of a tube with a through-hole through both ends thereof and also has a shape of a truncated circular cone or truncated pyramid in which a diameter of a through-hole increases from one end to the other end (FIG. 4A) or has a shape of a circular column or a prism in which a diameter of a through-hole is constant (FIG. 4B). The suture thread is coupled to the needle accommodation body in the above-described method.

[0030] The suture needle may generally have a straight or curved shape. The needle tip may have a generally and widely used shape such as round or cutted appearance. The length and thickness of the needle tip may be adjusted suitably for a purpose thereof.

[0031] The needle accommodation body may be formed of a material that is absorbable by a living body, for example, polylactic acid, polydioxanone, copolymer of lactic acid and glycolic acid, etc.,.

[0032] Depicted in figure 5 is the suture thread to which the needle accommodation body is coupled to both ends of the suture thread, the suture thread of FIGS. 1-3 and 6-8 to which the needle accommodation body is coupled to one end of the suture thread and/or the support body is coupled to the other end thereof, and the suture thread of FIG. 9 to which the support bodies are coupled to both ends of the suture thread.

[0033] The suture thread used includes a variety of shapes that are well known in the technical field to which the present invention pertains. The suture thread of the present invention may consist of one or two threads and may include at least one loop portion (FIGS. 6 and 7). FIG. 7A illustrates that the suture needle is inserted in the needle accommodation body. FIG. 7B illustrates that the suture needle is removed from the needle accommodation body.

[0034] As disclosed, a monofilament suture thread or a twisted suture thread, or a monofilament suture thread or twisted suture thread having barbs or cogs formed on an outer surface of the suture thread, may be used as the suture thread. A barbed suture thread is disclosed in Korean Patent Publication Nos. 10-2008-39345 and 10-2005-0108494,

Korean Utility Model Publication No. 20-320005, and U.S. Patent No. 5931855. A barb may be arranged on a fiber according to a necessary configuration and may be formed by an appropriate method including well-known items in the technical field to which the present invention pertains. The methods may use a knife or laser, injection molding by press molding, stamping, or cutting. A required number of acute-angled cuts are made in a suture thread. The size of a barb may be adjusted suitably for a purpose within a reasonable range. For example, the depth of a barb formed in a suture thread may be about 30-100 microns, which may be adjusted according to the diameter of a suture thread. The interval between barbs formed on the outer surface of a suture thread may be 100 microns to 1 mm or higher.

[0035] FIG. 8 illustrates a barbed suture thread according to an embodiment. Referring to FIG. 8A, two or more suture threads, each suture thread having a plurality of barbs that are inclined in the same direction in the front half portion and the rear half portion thereof at an angle of less than 90° or greater than 90° and less than 180° with respect to the lengthwise axis of the suture thread, are combined together. Then, one end of each of the suture threads is coupled to the suture needle and the other end of each of the suture threads is coupled to the support body. As another embodiment, referring to FIG. 8B, one or more suture threads having the barbs formed on the suture thread to be inclined in the opposite directions in the front half and rear half portions, for example, the barbs in the front half portion being all inclined at an angle of less than 90° with respect to the lengthwise axis of the suture thread toward the front end of the suture thread and the barbs in the rear half portion being all inclined at an angle of less than 90° with respect to the lengthwise axis of the suture thread toward the rear end of the suture thread, are half folded after passing through an eye of the suture needle. Then, both ends of each of the suture threads are coupled to the support body, or one end of each of the folded suture threads is inserted in the suture needle and pressed thereon and the other end thereof is coupled to the support body. Referring to FIG. 8C, the inclination directions of the barbs of the suture thread are different from those of the barbs of the suture thread of FIG. 8B. In this case, the suture thread is half folded after passing through the holes of the support body and two ends of the suture thread are coupled to the suture needle. For example, two, three, or four suture threads with barbs may be used and the number of suture threads may be adjusted according to the thickness or purpose of use of the suture thread. The directions of the barbs of the suture thread are schematically illustrated on the right side of each of FIGS. 8A, 8B and 8C. In an example of the suture thread manufactured as above, as illustrated in FIG. 8, the barbs are inclined toward the support body, thus forming an acute angle with the lengthwise direction of the suture thread. When the barbs have the above shape, during suturing, the suture thread may smoothly proceed forward and also the barbs prevents the suture thread from proceeding in the opposite direction to a direction of the suturing. When the suture needle is cut off after finishing the suturing, the suture thread is not released due to the barbs and thus no knotting is needed. As such, when two or more suture threads with barbs are used by being coupled to the support body and/or the needle accommodation body, no knotting is needed and a more firm knotting effect may be obtained. Furthermore, compared to a case of using a suture thread with barbs that is typically used, one thread may snap during suturing because the strength of the suture thread is reduced to about half or more. However, when two or more suture threads are used, the strength of the suture threads may be increased to double or more and thus the suture threads may be less snapped. Furthermore, since the number of barbs or the contact surface of each barb are increased to double or more, more firm suturing may be obtained and the suture thread may be prevented from proceeding backward.

[0036] In another embodiment, the support body is coupled to one end of the suture thread and the suture needle is coupled to the other end thereof, and a support body or the cone having a shape of a truncated circular cone or truncated pyramid and having a through-hole through both ends of the support body is inserted in the suture thread at a position close to the suture needle, as illustrated in FIG. 9. A truncated circular cone exhibiting less friction is more suitable as the cone. The cone is arranged such that a portion having a smaller diameter (front end) may face the suture needle and two knots A and B, each having a diameter larger than that of the front end, are respectively formed in front and rear of the front end (FIGS. 9A and 9B). The two knots A and B are formed close to each other. The knot A prevents the cone from escaping after suturing and the suture needle is removed. The knot B prevents the cone from being pushed backward during suturing. Even when suturing is completed and the suturing needle is removed, the cone is left at the end of the suturing thread. Thus, there is no need to make a knot after suturing and also there is no worry about untying of the suture thread. Another truncated circular cone or pyramid may be further provided in front of the knot A with a surface having a smaller diameter (front end) facing the suturing needle. Accordingly, the knot A may easily pass through tissue during suturing and thus suturing may be easily performed (FIG. 9B). A front cone is removed together when the suturing needle is removed after suturing and thus the knot A and the back cone may prevent the suturing thread from being released like FIG. 9A. The cone may be formed of, for example, an absorbable material such as copolymer of L-Lactide and Glycolide or a non-absorbable material such as polypropylene. The length of the cone may be, for example, about 1-10 mm. However, the length may be adjusted according to a site for use and purpose. The diameter of the through-hole through both ends of the support body of the cone may be, for example, about 0.1-2 mm at the front end having a relatively smaller diameter and about 0.5-5 mm at the rear end having a relatively larger diameter. However, the diameter may be adjusted according to a thickness and purpose of a suture thread.

[0037] In the suture thread with the barbs, one end of which is coupled to the support body (for example, FIG. 8), or the suture thread, one end of which is coupled to the support body and having a knot and cone formed at a portion close

to a portion connected to the suture needle (for example, FIG. 9), the other end of the suture thread that is not coupled to the support body may be coupled to the needle accommodation body or may be coupled directly to the suture needle for use. When the needle accommodation body functioning as a knot in a suturing site where suturing is completed is not used, the suture thread may not escape due to the barbs or the cone even when the suture needle is removed after suturing.

[0038] The suture thread may be formed of a non-absorbable material such as polypropylene, gold, stainless steel, titanium, nylon, polyvinylidene fluoride, polyester, braided silk, etc. or an absorbable material such as polydioxanone, but the present invention is not limited thereto.

[0039] According to an embodiment, a method of manufacturing a suture thread having a support body and/or a needle accommodation body includes operations of coupling one end of the suture thread to the support body and coupling the other end of the suture thread to the suture needle or the needle accommodation body.

[0040] The coupling of the suture thread to the support body includes passing the suture thread through a hole formed in the support body and then tying a knot on the suture thread to have a diameter larger than that of the hole of the support body or the through-hole. When two suture threads are used, the suture threads may be passed through the hole formed in the support body or through the through-hole and then tying the suture threads together or tying the suture threads into a knot.

[0041] The coupling of the suture thread to the suture needle may include putting a suture thread in a suture needle having a through-hole formed therein and pressing the suture needle, inserting a suture thread in a hole formed in a suture needle, or hanging a suture thread on a cut formed in a wall of a suture needle having a through-hole.

[0042] The coupling of the suture thread to the needle accommodation body may include bonding by melting an end of the suture thread and/or part of the needle accommodation body to be coupled to the suture thread, and inserting the suture thread in at least one hole formed in the needle accommodation body and tying the suture thread into a knot or tying the suture thread together to be larger than the diameter of the hole.

[0043] According to an embodiment, a method of manufacturing a suture thread includes operations of combining two suture threads, each suture thread having a plurality of barbs that are inclined in the same direction in the front half portion and the rear half portion of the suture thread, and coupling one end of each suture thread to a support body and the other end to a suture needle. Also, in another embodiment of the present invention, a suture thread having barbs that are inclined in the opposite directions in the front and rear half portions of the suture thread is half folded and then one end of the suture thread is coupled to a support body and the other end is coupled to a suture needle.

[0044] In another embodiment, a method of manufacturing a suture thread includes operations of coupling a support body to one end of the suture thread, tying the suture thread into a knot at a portion close to the other end of the suture thread, inserting a truncated circular cone or truncated pyramid that has a through-hole through both ends thereof in the suture thread at the front side of a knot formed on the suture thread to have a front end having a relatively smaller diameter face a suture needle, tying the suture thread into a knot in front of the cone, and coupling the other end of the suture thread to the suture needle. The method may further include inserting an additional cone between the suture needle and the knot in front of the cone to have the front end having a relatively smaller diameter face the suture needle.

[0045] A method of suturing using a suture thread having a needle accommodation body includes operations of sewing a suturing site using a suture needle provided in the needle accommodation body to which the suture thread is coupled, advancing the suture needle through tissue around an end portion of the suturing site so that the needle accommodation body is buried in or passes through the tissue, and removing the suture needle by pulling the suture needle toward a bottom end portion of the needle accommodation body. When the needle accommodation body with the suture thread is buried in the tissue and fixed therein, an end of the suture thread is also connected to the needle accommodation body. Thus, there is no worry about untying of the suture thread and there is no need to tie a knot.

INDUSTRIAL APPLICABILITY

[0046] The suture thread, the needle accommodation body, and the suture thread support body according to the present invention may be useful for suturing in various surgical operations such as suturing of damaged muscles, blood vessels, nerves, injuries, or surgical cuts, double eyelid surgery, wrinkles plastic surgery, etc.

Claims

1. A suture comprising one suture thread (10) and a first suture thread support body (40) that is coupled to one end of said suture thread (10) and has one through-hole through both end portions of the first suture thread support body (40) through which said suture thread (10) passes, said through-hole having a diameter larger than that of said suture thread, said first suture thread support body (40) having shape of a truncated circular cone, wherein said suture further comprises a first knot (42) tied on said one end of the suture thread (10) to have a diameter

greater than that of said through-hole, thus preventing during use of the suture, the one end of the suture thread (10) from being pulled into skin or tissue, wherein an end portion of said first suture thread support body (40) having a relatively smaller diameter is arranged in a direction toward said first knot (42), wherein the diameter of the through-hole decreases gradually according to the diameter of said first suture thread support body (40) while going toward the one end portion of said first suture thread support body (40), wherein the other end of said suture thread (10) is connected to a suture needle, and wherein the suture further comprises a second suture thread support body (51) having a shape of a truncated circular cone and having one through-hole extending through both end portions, wherein said second suture thread support body (51) is provided at a portion close to a portion of the suture thread (10) to which the suture needle is coupled, with said suture thread inserted in said through-hole of said second suture thread support body (51), said second suture thread support body (51) being arranged with a surface or a front end having a relatively smaller diameter facing said suture needle, **characterized in that** the suture further comprises a second knot and a third knot (42) of the suture thread tied in respective rear and front of the front end of said second suture thread support body (51) to have a diameter relatively larger than that of said through-hole at the front end of said second suture thread support body (51), and **in that** the end portions of said first and second suture thread support bodies (40), (51) having a relatively larger diameter are arranged so as to face each other.

2. The suture of one of claim 1, **characterized in that** said suture thread (10) is formed of two or more barbed threads.

3. The suture of one of claims 1 and 2, **characterized in that** the suture further comprises a third suture thread support body (51) having a shape of a truncated circular cone and having one through-hole extending through both end portions, the third suture thread support body (51) being arranged between the suture needle and the third knot of the suture thread (10) tied in front of the second suture thread support body (51), with a surface or a front end having a relatively smaller diameter facing the suture needle.

4. A method of manufacturing a suture according to one of claims 1 to 3, said suture comprising a suture thread (10), a first suture thread support body (40), a second suture thread support body (51), the method comprising coupling one end of the suture thread (10) to the first suture thread support body (40) by passing said thread through said through-hole of said first suture thread support body (40) and tying said thread (10) so as to form said first knot (42), **characterized in that** the method further comprises:

tying said suture thread into a second knot (42) at a portion close to the other end of the suture thread;
 providing said second suture thread support body (51) having a shape of a truncated circular cone and having one through-hole through both end portions on the suture thread in front of the second knot toward a suture needle, with a front end of the second suture thread support body (51) having a relatively smaller diameter facing the suture needle;
 tying the suture thread into a third knot (42) in front of the second suture thread support body (51); and
 coupling an end of the suture thread (10) to the suture needle.

5. The method of claim 4, **characterized in that** two threads with barbs formed inclined in the same direction are gathered and one end of each the two threads is coupled to said first suture thread support body (40).

6. The method of claim 5, **characterized in that** a thread having barbs formed inclined in opposite directions in a front half portion and a rear half portion of the thread is folded in half and one end of the thread is coupled to said first suture thread support body.

7. The method of claim 4, **characterized in that** the method further comprises providing a third suture thread support body (51) having a shape of a truncated circular cone and having one through-hole through both end portions between the suture needle and the third knot tied in front of the second suture thread support body (51), with a front end having a relatively smaller diameter facing the suture needle.

Patentansprüche

1. Nahtmaterial aufweisend einen Nahtfaden (10) und einen ersten Nahtfadenstützkörper (40), der an ein Ende des Nahtfadens (10) angebunden ist und ein Durchgangsloch durch beide Endabschnitte des ersten Nahtfadenstützkörpers (40) aufweist, durch das der Nahtfaden (10) hindurchläuft, wobei das Durchgangsloch einen Durchmesser aufweist, der größer als der Durchmesser des Nahtfadens ist, wobei der erste Nahtfadenstützkörper (40) eine Form eines Kreiskegelstumpfs aufweist, wobei das Nahtmaterial weiter einen ersten Knoten (42) aufweist, der an einem

Ende des Nahtfadens (10) geknotet ist, damit ein größerer Durchmesser als der des Durchgangslochs vorhanden ist, der somit während der Verwendung des Nahtmaterials verhindert, dass das eine Ende des Nahtfadens (10) in die Haut oder das Gewebe hineingezogen wird, wobei ein Endabschnitt des ersten Nahtfadenstützkörpers (40), der einen relativ kleineren Durchmesser aufweist, in Richtung zum ersten Knoten (42) angeordnet ist, wobei der Durchmesser des Durchgangslochs entsprechend dem Durchmesser des ersten Nahtfadenstützkörpers (40) sukzessive in Richtung des einen Endes des Nahtfadenstützkörpers (40) abnimmt, wobei das andere Ende des Nahtfadens (10) mit einer Nahtnadel verbunden ist, und wobei das Nahtmaterial weiter einen zweiten Nahtfadenstützkörper (51) aufweist, der eine Form eines Kreiskegelstumpfs und ein Durchgangsloch aufweist, das sich durch beide Endabschnitte erstreckt, wobei der zweite Nahtfadenstützkörper (51) an einem Abschnitt nahe eines Abschnitts des Nahtfadens (10) vorgesehen ist, der mit der Nahtnadel verbunden ist, wobei der Nahtfaden in das Durchgangsloch des zweiten Nahtfadenstützkörpers (51) eingeführt ist und der zweite Nahtfadenstützkörper (51) mit einer Oberfläche oder einer Stirnseite, die einen relativ kleineren Durchmesser aufweist, zur Nahtnadel weisend angeordnet ist,

dadurch gekennzeichnet, dass

das Nahtmaterial weiter einen zweiten Knoten und einen dritten Knoten (42) des Nahtfadens aufweist, der an der entsprechenden Hinter- und Vorderseite der Stirnseite des zweiten Nahtfadenstützkörpers (51) geknotet ist, damit ein Durchmesser vorhanden ist, der relativ größer ist als der des Durchgangslochs an der Stirnseite des zweiten Nahtfadenstützkörpers (51), und dadurch, dass

die Endabschnitte des ersten und des zweiten Nahtfadenstützkörpers (40), (51), die einen relativ größeren Durchmesser aufweisen, so angeordnet sind, dass sie zueinander weisen.

2. Nahtmaterial nach Anspruch 1, **dadurch gekennzeichnet, dass** der Nahtfaden (10) mit zwei oder mehr mit Widerhaken versehenen Fäden ausgebildet ist.

3. Nahtmaterial nach einem der Ansprüche 1 oder 2, **dadurch gekennzeichnet, dass** das Nahtmaterial weiter einen dritten Nahtfadenstützkörper (51) aufweist, der eine Form eines Kreiskegelstumpfs aufweist und der ein Durchgangsloch aufweist, das sich durch beide Endabschnitte erstreckt, wobei der dritte Nahtfadenstützkörper (51) zwischen der Nahtnadel und dem dritten Knoten des Nahtfadens (10) angeordnet ist, der vor dem zweiten Nahtfadenstützkörper (51) angebunden ist, und eine Oberfläche oder Stirnseite mit einem relativ kleineren Durchmesser aufweist, der zur Nahtnadel weist.

4. Verfahren zur Herstellung eines Nahtmaterials nach einem der Ansprüche 1 bis 3, wobei das Nahtmaterial einen Nahtfaden (10), einen ersten Nahtfadenstützkörper (40), einen zweiten Nahtfadenstützkörper (51) aufweist, wobei das Verfahren das Anbinden eines Endes des Nahtfadens (10) an den ersten Nahtfadenstützkörper (40) durch das Hindurchfädern des Fadens durch das Durchgangsloch des ersten Nahtfadenstützkörpers (40) und das Knoten des Fadens (10) aufweist, derart, um den ersten Knoten (42) zu formen, **dadurch gekennzeichnet, dass** das Verfahren weiter aufweist: das Knoten des Nahtfadens zu einem zweiten Knoten (42) in einem Abschnitt, der sich nahe am anderen Ende des Nahtfadens befindet;
Bereitstellen des zweiten Nahtfadenstützkörpers (51) auf dem Nahtfaden vor dem zweiten Knoten in Richtung der Nahtnadel, der eine Form eines Kreiskegelstumpfs aufweist und ein Durchgangsloch durch beide Endabschnitte aufweist, wobei eine Stirnseite des zweiten Nahtfadenstützkörpers (51), die einen relativ kleineren Durchmesser aufweist, zur Nahtnadel weist;
Knoten des Nahtfadens zu einem dritten Knoten (42) vor dem zweiten Nahtfadenstützkörper (51); und Anbinden eines Endes des Nahtfadens (10) an die Nahtnadel.

5. Verfahren nach Anspruch 4, **dadurch gekennzeichnet, dass** zwei Fäden mit Widerhaken, die in die gleiche Richtung geneigt ausgebildet sind, zusammengefasst werden und ein Ende eines jeden der beiden Fäden an den ersten Nahtfadenstützkörper (40) angebunden ist.

6. Verfahren nach Anspruch 5, **dadurch gekennzeichnet, dass** ein Faden, der Widerhaken aufweist, die in einem Abschnitt der vorderen Hälfte und einem Abschnitt der hinteren Hälfte des Fadens in entgegengesetzte Richtungen geneigt ausgebildet sind, auf die Hälfte zusammengefasst wird und ein Ende des Fadens an den ersten Nahtfadenstützkörper angebunden ist.

7. Verfahren nach Anspruch 4, **dadurch gekennzeichnet, dass** das Verfahren weiter das Bereitstellen eines dritten Nahtfadenstützkörpers (51) aufweist, der eine Form eines Kreiskegelstumpfs und ein Durchgangsloch durch beide Endabschnitte aufweist, zwischen der Nahtnadel und dem dritten Knoten, der vor dem zweiten Nahtfadenstützkörper (51) geknotet ist, und eine Stirnseite, die einen relativ kleineren Durchmesser aufweist, die zur Nahtnadel weist.

Revendications

1. Dispositif de suture comprenant un fil de suture (10) et un premier corps de support de fil de suture (40) qui est couplé à une extrémité dudit fil de suture (10) et présente un trou de passage à travers les deux portions d'extrémité du premier corps de support de fil de suture (40) par lequel passe ledit fil de suture (10), ledit trou de passage présentant un diamètre supérieur à celui dudit fil de suture, ledit premier corps de support de fil de suture (40) ayant la forme d'un cône circulaire tronqué, dans lequel ledit dispositif de suture comprend en outre un premier nœud (42) noué sur ladite une extrémité du fil de suture (10) pour former un diamètre supérieur à celui dudit trou de passage, empêchant ainsi, lors de l'utilisation du dispositif de suture, qu'une extrémité du fil de suture (10) soit tirée dans la peau ou le tissu, dans lequel une portion d'extrémité dudit premier corps de support de fil de suture (40) présentant un diamètre relativement plus petit est agencée dans une direction vers ledit premier nœud (42), dans lequel le diamètre du trou de passage diminue progressivement en fonction du diamètre dudit premier corps de support de fil de suture (40), tout en allant vers l'une extrémité dudit premier corps de support de fil de suture (40), dans lequel l'autre extrémité dudit fil de suture (10) est reliée à une aiguille de suture, et dans lequel le dispositif de suture comprend en outre un second corps de support de fil de suture (51) ayant la forme d'un cône circulaire tronqué et comportant un trou de passage qui s'étend à travers les deux portions d'extrémité, dans lequel ledit second corps de support de fil de suture (51) est prévu au niveau d'une portion proche de la portion du fil de suture (10) sur laquelle l'aiguille de suture est reliée, ledit fil de suture étant inséré dans ledit trou de passage dudit second corps de support de fil de suture (51), ledit second corps de support de fil de suture (51) étant agencé avec une surface ou une extrémité antérieure ayant un diamètre relativement plus petit faisant face à ladite aiguille de suture, **caractérisé en ce que** le dispositif de suture comprend en outre un second nœud et un troisième nœud (42) du fil de suture, noués respectivement à l'avant et à l'arrière de l'extrémité antérieure dudit second corps de support de fil de suture (51) pour avoir un diamètre relativement plus grand que celui dudit trou de passage au niveau de l'extrémité antérieure dudit second corps de support de fil de suture (51), et **en ce que** les portions d'extrémité desdits premier et second corps de support de fil de suture (40), (51), présentant un diamètre relativement plus grand sont disposées de manière à se faire face.
2. Dispositif de suture selon la revendication 1, **caractérisé en ce que** ledit fil de suture (10) est constitué de deux ou plusieurs fils barbelés.
3. Dispositif de suture selon l'une des revendications 1 et 2, **caractérisé en ce que** le dispositif de suture comprend en outre un troisième corps de support de fil de suture (51) ayant la forme d'un cône circulaire tronqué et présentant un trou de passage qui s'étend à travers les deux portions d'extrémité, le troisième corps de support de fil de suture (51) étant disposé entre l'aiguille de suture et le troisième nœud du fil de suture (10) noué à l'avant du second corps de support de fil de suture (51), avec une surface ou une extrémité antérieure présentant un diamètre relativement plus petit faisant face à l'aiguille de suture.
4. Procédé de fabrication d'un dispositif de suture selon l'une des revendications 1 à 3, ledit dispositif de suture comprenant un fil de suture (10), un premier corps de support de fil de suture (40), un second corps de support de fil de suture (51), le procédé comprenant le couplage d'une extrémité du fil de suture (10) au premier corps de support de fil de suture (40) en faisant passer ledit fil à travers ledit trou de passage dudit premier corps de support de fil de suture (40) et en nouant ledit fil (10) de manière à former ledit premier nœud (42), **caractérisé en ce que** le procédé comprend en outre :
- nouer ledit fil de suture dans un second nœud (42) sur une portion proche de l'autre extrémité du fil de suture ;
fournir ledit second corps de support de fil de suture (51) ayant la forme d'un cône circulaire tronqué et ayant un trou de passage à travers les deux portions d'extrémité sue le fil de suture à l'avant du second nœud en direction d'une aiguille de suture, avec une extrémité antérieure du second corps de support de fil de suture (51) ayant un diamètre relativement plus petit faisant face à l'aiguille de suture ;
nouer le fil de suture à un troisième nœud (42) à l'avant du second corps de support de fil de suture (51) ; et
coupler une extrémité du fil de suture (10) à l'aiguille de suture.
5. Procédé selon la revendication 4, **caractérisé en ce que** deux fils présentant des barbelures inclinées dans la même direction, sont rassemblés et une extrémité de chacun des deux fils est couplée audit premier corps de support de fil de suture (40).
6. Procédé selon la revendication 5, **caractérisé en ce qu'**un fil présentant des barbelures inclinées dans des directions opposées d'une portion de moitié antérieure et une portion de moitié postérieure du fil, est plié en deux et qu'une

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extrémité du fil est couplée audit premier corps de support de fil de suture.

7. Procédé selon la revendication 4, **caractérisé en ce que** le procédé comprend en outre la fourniture d'un troisième corps de support de fil de suture (51) ayant la forme d'un cône circulaire tronqué et comportant un trou de passage à travers les deux portions d'extrémité entre l'aiguille de suture et le troisième nœud, noué à l'avant du second corps de support de fil de suture (51), avec une extrémité antérieure ayant un diamètre relativement plus petit faisant face à l'aiguille de suture.

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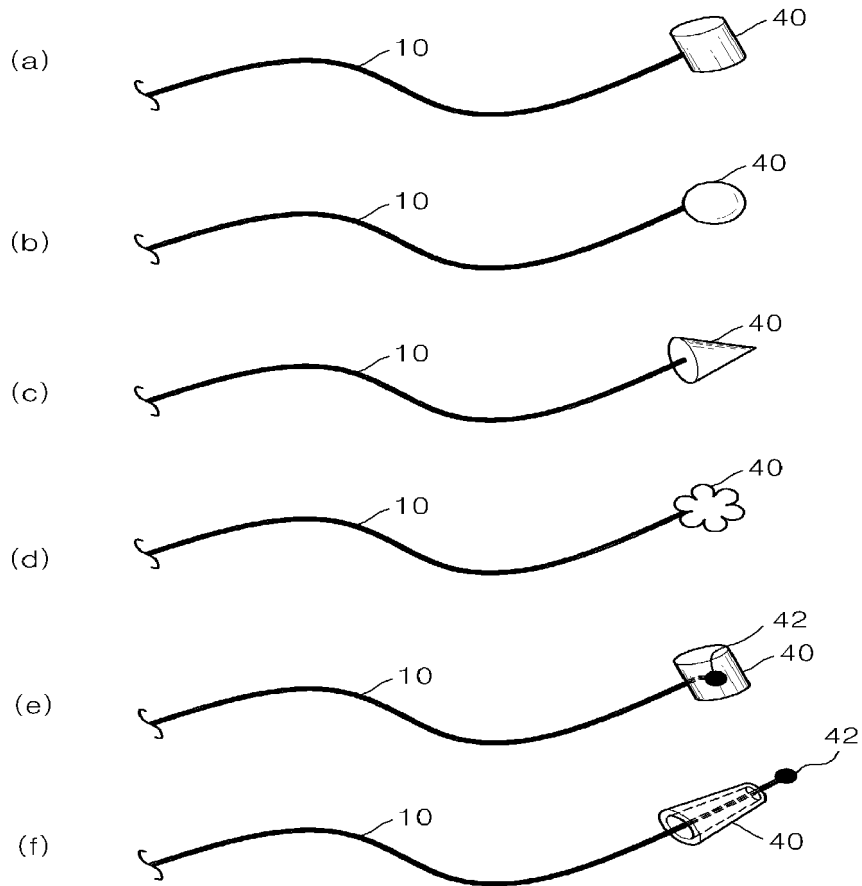
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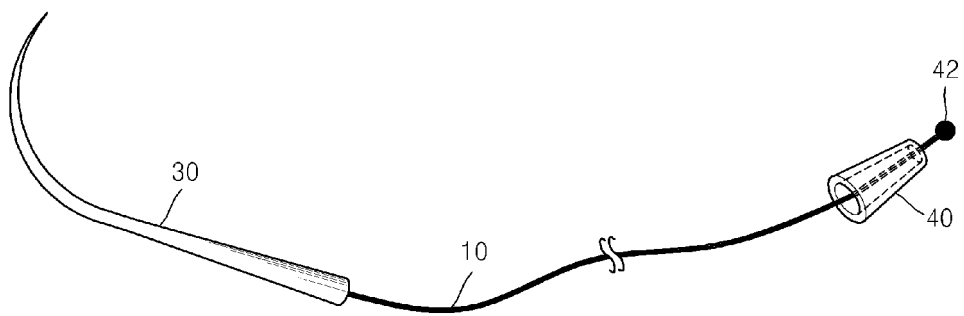
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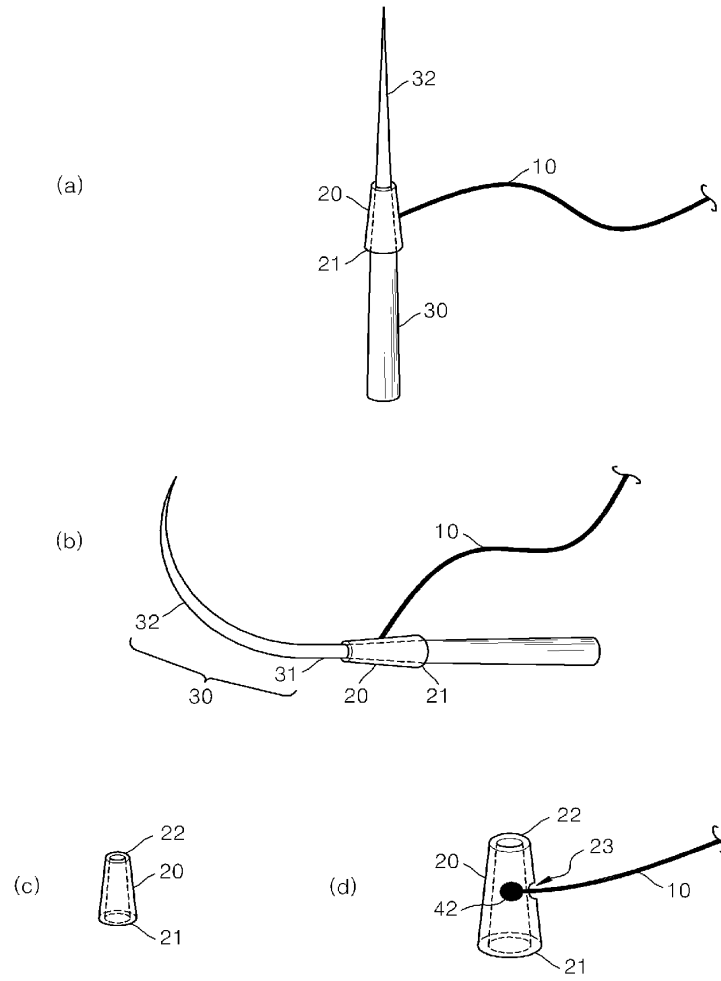
[Fig. 1]



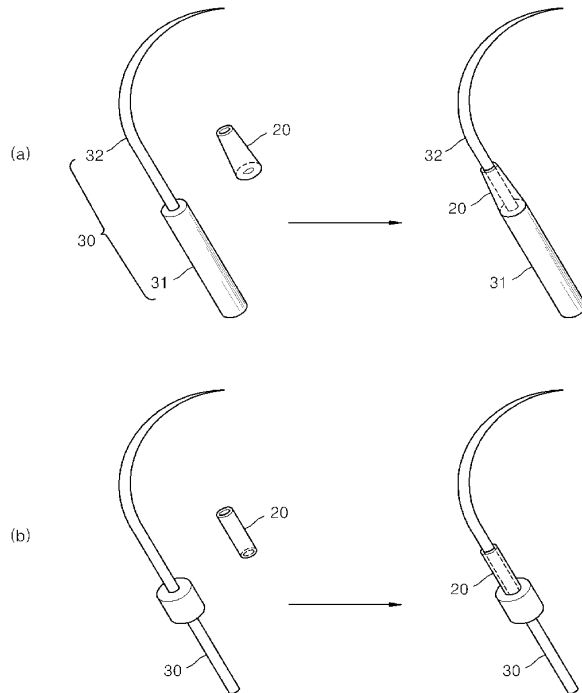
[Fig. 2]



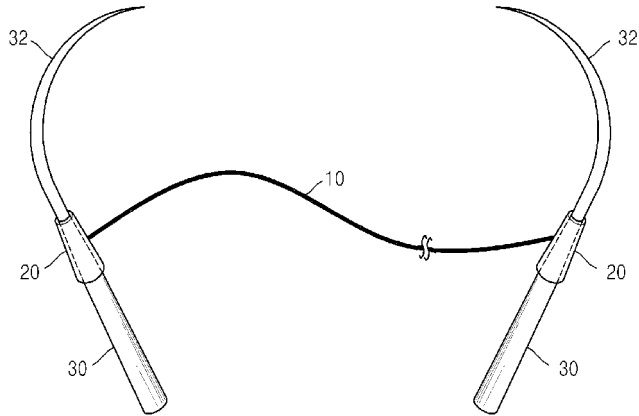
[Fig. 3]



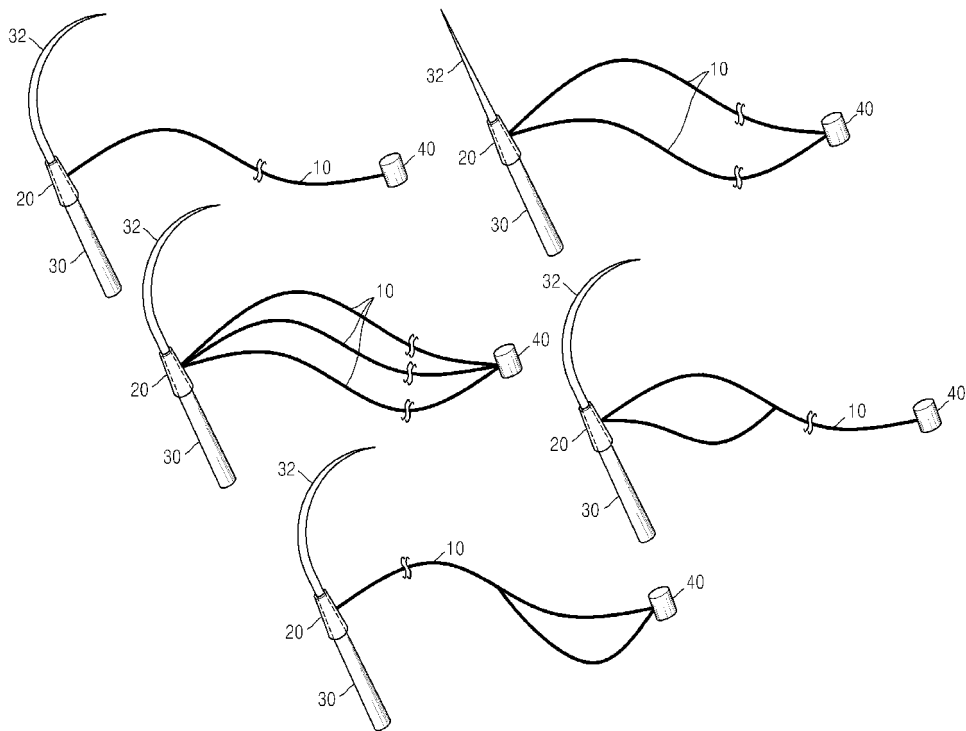
[Fig. 4]



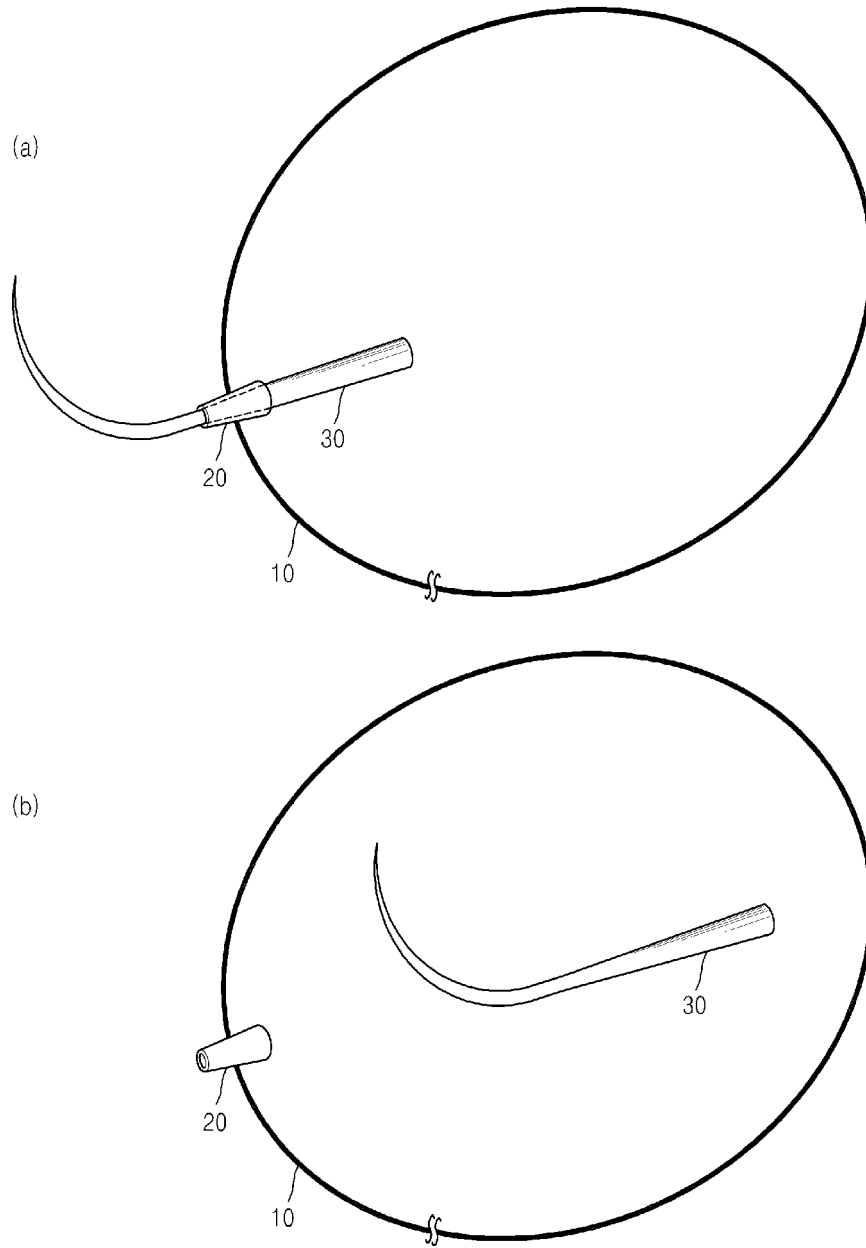
[Fig. 5]



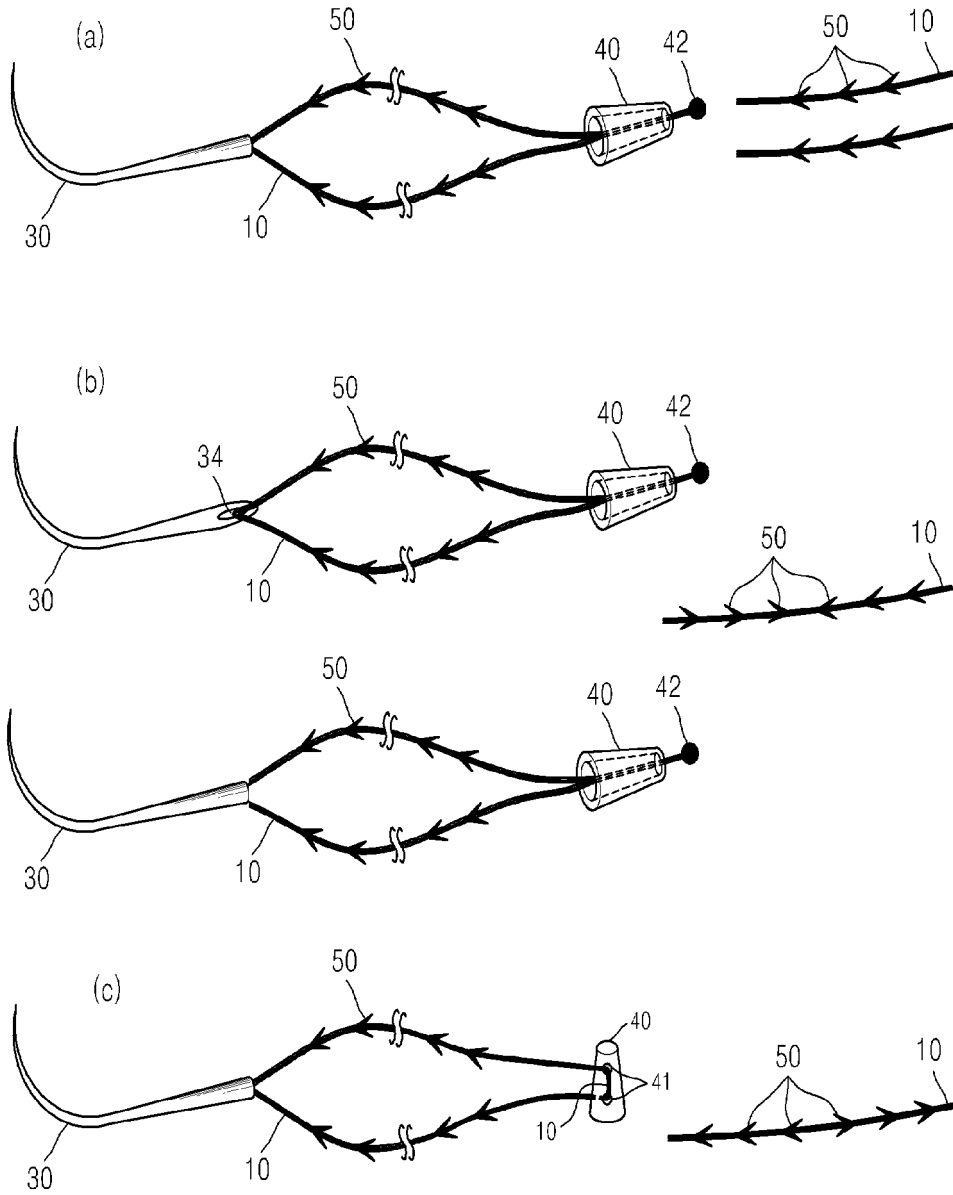
[Fig. 6]



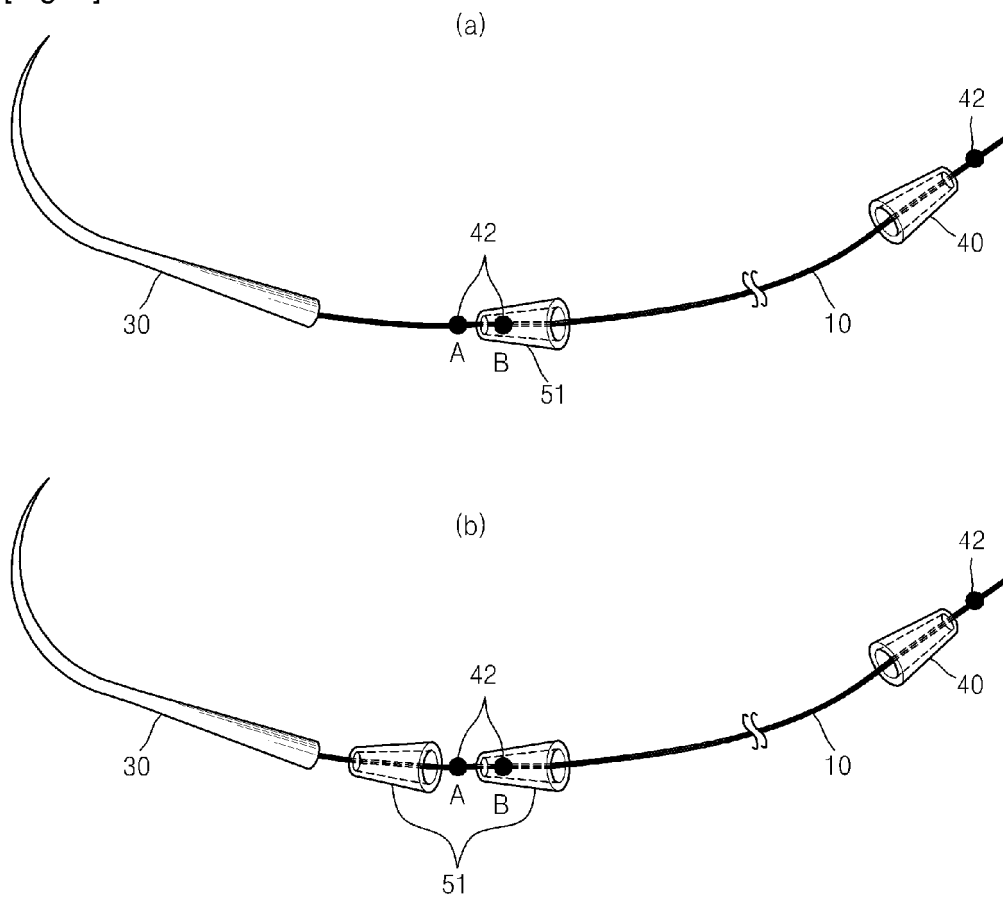
[Fig. 7]



[Fig. 8]



[Fig. 9]



REFERENCES CITED IN THE DESCRIPTION

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